

(2) any sewage matter; (3) any poisonous, noxious, or polluting liquid from any manufacturing process; and (4) any poisonous, noxious, or polluting solid or liquid matter from any mine.

Mr. Higgins justly remarks that "the successful working of the Act will much depend upon the meaning of the word '*polluting*' as therein used, by those with whom its interpretation rests." In order to understand the drift of this remark it is necessary to observe that the Act of 1876 virtually gives no standard of purity, though the Commission of 1868 recommended an extensive and somewhat stringent list of standards. We think that on the whole the Act is right in the omission, as a suggestion made by Mr. Crookes in his evidence before the House of Lords in 1873, namely, "that the river itself should be the standard of purity, and that no liquid should be allowed to be sent into a river if the liquid contains a greater percentage of impurity than the river itself," seems to be a very feasible standard and one easily and quickly referred to. Again, as Mr. Crookes pointed out, the standard would naturally improve, as nothing worse than the river at any given point would enter it, whence in the course of nature amelioration would ensue, while the process being gradual would give the manufacturer or township time to improve their waste or sewage, and one of the most disastrous sources of trouble the injury to the water-course from the casting into it of solid refuse would be at once prohibited; as would pollution by actually poisonous matter, such as arsenical and other liquids.

It appears to us that guided by *competent* chemical evidence there ought to be no difficulty in obtaining legal decisions as to the polluting or harmless character of any liquid that may be called in question, while as to solid matters, of any kind whatever, the mere fact of their entry into a stream ought to be an offence without reference to their character. On the whole we think the act, though perhaps partaking too much of the "permissive" character, which is so prominent a feature of modern legislation, to be one which, if conscientiously used with due consideration to the facts of each individual case ought to work great good. In the race for wealth we are perhaps too little apt to think of the future. The brooks and running streams like the land we live on are not ours to do as we like with, but like an entailed estate are only held in trust for the next heir, and like national or family honour should be handed down to posterity pure and un sullied.

Mr. Higgins has devoted great care to his treatise on the Act, and his chemical training has evidently stood him in good stead, the numerous references to cases bearing on the various points show a laborious study of the legal aspects of the case and will add greatly to the value of the work in the eyes of the legal profession, for whose information it is primarily intended.

R. J. FRISWELL

#### OUR BOOK SHELF

*The Cradle of the Blue Nile; a Visit to the Court of King John of Ethiopia.* By E. A. De Cosson, F.R.G.S. Two vols. With Map and Illustrations. (London: John Murray, 1877.)

ALTHOUGH Mr. De Cosson did not go over any new ground in his tour, and although he was unable even to

carry out his original plan, we are sure that most readers will find much that is new and certainly interesting in his volumes. He went slowly southward from Massowah to Lake Tzana, north-west to the lower Bahr-el-Azrek, down the Nile to Berber, and across to Saakim. He won the favour of King John, of whom he speaks as an able, well-meaning ruler, and was thus able to see much of the life of the people, and learn much of the antiquities and the character of the country that otherwise he would have missed. To any one wishing to obtain an attractive account of the past history and present condition of Abyssinia, we strongly commend Mr. De Cosson's work.

*The Tiber and its Tributaries, their Natural History and Classical Associations.* By Strother A. Smith, M.A. Map and Illustrations. (London: Longmans and Co., 1877.)

THE idea of this work is, we think, a happy one, and its execution successful. The object is to gather under one head everything of interest relating to the Tiber. This has necessarily involved a great amount of research, and the result will be welcomed both by the student of history, the "scholar," and the geographer. Considerable space is devoted to the inundations of the Tiber, and also to its birds and its fishes. Two nicely-coloured plates are devoted to the *muræna*, the mullet, the lamprey, and the sturgeon. The Tay, at Perth, we should inform Mr. Smith, is no more an "estuary" than the Thames at London Bridge, unless the word is applied to all that part of a river reached by the tide.

*A Short Account of the Principal Geometrical Methods of Approximating to the Value of  $\pi$ .* For the Use of Colleges and Schools. By the Rev. G. Pirie, M.A. (Macmillan, 1877.)

*Elements of Geometry Based on Euclid.* Book I. For Elementary and Middle Class Schools. By E. Atkins, B.Sc. Collins's School Series. (Glasgow: Collins, 1877.)

*Takimetry. Concrete Geometry in Three Lessons. Accessible, Inaccessible, Incalculable.* Translated by D. W. Gwynne, M.D., from the French of E. Lagout. (Glasgow: Collins, 1877.)

THE little pamphlet first named does not attack the problem from the circle-squarer's point of view—the use of the word "approximating" sufficiently points this out—but gives an interesting account of what was done for the question between the times of Archimedes and Huyghens. A few elementary propositions lead up to what was attempted by Willebrord Snell ("Cyclometricus," 1621) and elegantly effected by Huyghens. Mr. Pirie's object is to correct what he deems a defect in our present works on Trigonometry, and to supply a few simple propositions "on the threshold of the subject." We can recommend the book as one suitable for being put into the hands of sixth form pupils. A few references are supplied to fuller sources of information upon the quadrature of the circle.

Mr. Atkins's book seems to differ but little from the ordinary forms of Euclid as now printed. One feature is the addition of short side-notes drawing attention to the objects of the successive steps of the construction and proof. There is a short collection of sixty exercises grouped under the propositions upon which they depend. Some of these appear to us wrongly placed, and a few incorrectly printed. The work is neatly got up and of a handy form.

If all that is said of takimetry by its admirers be true a revolution in mathematical instruction may be speedily expected. "With one hundred lessons of takimetric instruction any one can very well learn geometry, algebra, arithmetic, and mechanics." "The classical geometry of Euclid *disguises its object, its utility*, and thus, for a considerable time, yields a barren and discouraging result, whilst takimetry is able, on the other hand, to produce

the miracle of an astonishing progress." In the Fundamental Takimetry (introductory to Takitechny) objects are classified into square, round, pointed, and truncated forms. The three lessons of Takimetry are (1) equivalence; (2) resemblance; (3) the three squares of a right-angled triangle (*i.e.*, "Euc." i. 47). The subject requires only three lectures, each of an hour's duration. Amongst the subjects for measurement are the accessible, the inaccessible, and the incalculable (*i.e.*, those which depend upon the circle). There is much that is good in this book, though in its present form it is overweighted with a mass of extraneous matter. By aid of the prettily-coloured figures (there are models, also, we are told, to accompany the book) a considerable knowledge of mensuration, we think, might be imparted even to dull boys. We could take exception to the translation in many places.

### LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

#### Museum Reform

"J. P." suggests, under the head of "Museum Reform" (vol. xvi. p. 183), the idea of a conference of museum keepers, out of which a permanent union among museum officers might result. I am of opinion that this idea is an excellent one, and that the administration of the museums of all countries would gain a great deal if an opportunity to museum officers were offered to interchange their opinions and to communicate to each other their different practical experiences. Perhaps some arrangements and rules might generally be accepted, as, *e.g.*, to labelling specimens, exchanging duplicates, publishing annual reports in a journal *ad hoc*, &c.

A. B. MEYER

Dresden, July 9

#### Koenig's Tuning-Forks

THE letter of Herr Koenig inserted in NATURE (vol. xvi. p. 162) did not come under my notice till July 8. On October 27 last year I counted all the 64 sets of beats in Herr Appunn's tonometer, one through 15, the rest through 20 seconds with a pocket chronometer which was gaining less than 4 seconds a day, and found every set of beats perfectly true. The perfection of the consonances, more than 80 of which I tested mechanically, by observing the beats that arose on flattening one of the two consonant notes, seemed to me to eliminate all possible error of irregular counting. The suggestion now is that the beats were perfectly regular and uniform, and that no exception need be taken to my counting, but that Herr Appunn's pendulum was originally incorrect, to such an extent that what appeared to him 80 beats in 20 seconds, were only 79.27, and that my chronometer was not sufficient to detect the error. If this were the case all the numbers on Herr Appunn's tonometer would have to be reduced by as nearly as possible 9 in 1,000, which would make them agree with Herr Koenig's. I shall therefore have to re-test the tonometer with a larger chronometer and if possible count each set of beats for a longer time. I shall not be able to undertake this examination at present, but I shall not neglect doing so, and will inform you of the result. It is right, however, to say that on July 9 and 10 I received communications from Prof. McLeod showing that his improved instrument for counting vibrations gave results almost exactly agreeing with Herr Koenig's numbers. The marked difference of Herr Appunn's and Herr Koenig's numbers will I hope lead to such an examination of the subject as will result in an accurate determination of pitch that can be generally accepted.

ALEXANDER J. ELLIS

Kensington, July 11

P.S.—I have this morning received a letter from Herr Appunn, in which he tells me that the letter of Prof. Helmholtz,

quoted by Herr Koenig, was received eleven or twelve years ago, and that the error of Herr Appunn's pendulum there pointed out was corrected more than ten years ago. He also refers me to pp. 46-7 of Prof. W. Preyer's tract "Ueber die Grenzen der Tonwahrnehmung," Jena, 1876, in which, by a calculation there detailed, Prof. Preyer shows that the absolute pitch of two of Herr Koenig's forks, which should have been 128 and 256, were 129.1 and 258.2; and says that "the determination is as exact as possible, so that the first decimal place can be fully trusted." I made another fork to be 258.4, and I know by comparison of several specimens that Koenig's forks do not always agree within more than .2 vibrations.

A. J. E.

July 16

#### On a Fish-sheltering Medusa

WHILE collecting some three weeks since on the south shore of Killary bay in Connemara, I observed that out of a number of the common *Aurelia aurita* moving about in a rocky inlet below me, one was invariably accompanied by a small fish, of about an inch or an inch and a quarter in length, which had established itself inside of the hemispherical disc.

Occasionally the Medusa turned in its pulsations, so as to bring the umbrella undermost, when the fish would shoot hastily out, but the Medusa had no sooner righted itself, than the fish returned, and seizing its opportunity, swam in between the marginal tentacles, and close up to the fringes of the actinostome, remaining distinctly visible through the pellucid disc.

I afterwards noticed several other *Aurelia* similarly attended, but was not able, unfortunately, to identify the fish, which invariably darted off at the most distant approach of a landing-net—it appeared, however, so far as I could judge, to be the young of one of the larger species. Perhaps some of your readers could contribute suggestions on that point.

Associations of a similar character have, I know, been frequently observed in the case of the *Physalidæ* and other *Acalephæ*, but not, so far as I am aware, in connection with this species.

E. LAWLESS

#### The Earth and Moon

I HAVE only now (July 12) noticed Prof. Tait's remark respecting a sentence, or rather half a sentence, which he quotes from an article of mine in the *Cornhill Magazine* for June. It runs thus: "What mathematicians call the moving force exerted by the earth on the moon is eighty-one times greater than the corresponding force exerted by the moon on the earth." This admits of an interpretation implying gross ignorance on my part—ignorance, *viz.*, of the fact that the moon pulls the earth just as strongly as the earth pulls the moon. It also admits of an interpretation accordant with fact, for the moving force exerted by the earth on each unit of mass in the moon is eighty-one times greater than the corresponding force exerted by the moon on each unit of mass in the earth. I do not think anyone is likely to believe that I made the mistake imputed to me by Prof. Tait, in this instance, any more than that I made an equally absurd blunder which he attributed to me in your columns several months ago, or that he himself made the ludicrous blunder attributed to him (*in jest*) by my humorous friend, Prof. Nipher, of St. Louis. But as a mere matter of fact, I may point out that the half-sentence quoted by him is completed by a half-sentence leaving no doubt as to my real meaning, and is immediately preceded by the statement that "the moon pulls the earth just as strongly as the earth pulls the moon."

London, July 12

RICHD. A. PROCTOR

#### Blue and Yellow Crocuses

REFERRING to Mr. W. B. Tegetmeier's letter in NATURE, vol. xvi. p. 163, I can say that I once had a pony born and bred on Dartmoor, which had never seen oats until it came into my father's stable in the fourth year of its age, and it refused them. We induced it to eat oats by mixing them with hay and gradually reducing the quantity of hay until the oats predominated.

Penzance, July 10

THOS. CORNISH

#### Japanese Mirrors

MORE than eleven years ago, in February, 1866, I published in *The Reader* (since extinct), a letter giving, I venture to think,